

Specification

Interdental brush and interdental brush set

Technical Field

The present invention relates to an interdental brush used for removing plaque and food ort remaining between teeth, and in particular to an interdental brush of which brush part is exchangeable.

Prior Art

Conventionally toothbrush has been widely used as sanitary fittings for maintaining good sanitary conditions in the mouth. Toothbrush is suitable for cleaning tooth surfaces, however toothbrush has some problems as to removal of plaques, food ort and the like remaining between teeth, such food remains and plaques may cause decayed teeth. A thin durable thread so-called dental froth and interdental brush produced by pinching filaments between two-folded thin metal wire and then twisting the wire together with filaments are known as cleaning tools of food ort and plaques between teeth. Although the dental froth is suitable for cleaning remains between teeth after he or she familiarizes the operation, there are still some problems such that it takes time for familiarization and the froth is rather easy to cut. In this regard, interdental brush, used by inserting brush part into spaces between teeth, is easy to use and widely utilized. Figure 5 and Figure 6 illustrate examples of such interdental brush. Figure 5 is an example of interdental brush of which longitudinal direction of the handle is parallel to the brush axis direction (cf. Laid-Open Patent No. 241805/92, Laid-Open Patent No. 70812/94). However brush filaments of such interdental brush are soon cut or worn out, metal wire is bent or twisting is loosened. Usually wear of the bristles are more than the handle, and the whole brush must be discarded after a few times of use, therefore the handle must be discarded together with the brush part. However the other parts such as handle are still in usable state, therefore an interdental brush having an exchangeable brush part has been already proposed under demand for resource saving and cost reduction. Figure 6 shows an example of an interdental brush having exchangeable brush part of which longitudinal direction of the handle is approximately vertical to the direction of the brush axis.

Figure 7 illustrates another example of such interdental brush of which brush part is exchangeable (cf. Laid-Open Patent 232506/84). In this interdental

brush, the brush 42 is made by aligning filaments between two-folded metal wire and then twisting the wire, then the brush part is formed by fixing the end of the twisted wire to the shaft 40. At the other end of the brush part, a cylindrical portion 43 is formed, the cylindrical portion 43 is inserted into the fixing hole 44 opening at an end of the handle in the longitudinal direction of the handle axis, and then the brush may be used. When changing the brush part, simply drawing out the old brush part and then inserting another new replacement brush part.

However in the conventional brush-exchangeable interdental brush, as the inserting direction of the brush part is parallel to the direction of the brush axis, a problem arises such that the brush part is easy to drop out of the fixing hole during brushing. In the interdental brush of Figure 6, for example, as the brush axis direction is parallel to the inserting direction of the brush part into the handle, the brush part is apt to drop out of the handle due to friction force between brush and teeth during brushing. In the case of Figure 7, the brush part is also apt to drop out during brushing due to the same reason.

To prevent dropout of the brush part in those examples, handling of brush exchange becomes complicated, and further in the case of Figure 7, as the handle is set in extension direction of the brush axis, it is difficult to insert the brush deep in the mouth, consequently the handleability is bad especially in the case of cleaning spaces between molars, thus it is necessary to bend the brush axis, which deteriorates durability of the interdental brush. Further during exchange operation of brush part, hands or fingers often touch a new replacement brush and contaminate the brush to impair cleanliness. On the other hand when exchanging a brush part after use, user will touch the used brush contaminated by plaques, and hands and fingers are contaminated as well. Further the shape becomes complicated such that the brush fixing portion is made excessively large in order to strengthen brush holding portion of the handle so as to prevent brush part dropout during use, the complicated shape irritates inside the mouth, intensifies a foreign body feeling and deteriorates use feeling when brush part is put in the oral cavity.

Disclosure of the Invention

The present invention aims to provide an interdental brush of which brush part does not drop out during brushing, in particular, an interdental brush which is easy to clean plaque or food oat between molars. Further the brush part of the interdental brush can be easily detached through one touch operation without

contacts between brush and hands or fingers so that contacts of hands or fingers do not impair the brush cleanliness during attachment of brush part to a handle, and also plaques clagging the brush do not contaminate hands or fingers during disposition of old brush part. The interdental brush of the present invention has a compact shape, good use feeling and does not irritate oral cavity.

The present invention relates to an interdental brush having a brush part and a handle where the brush part is exchangeable characterized in that the brush part has an insertion groove having facing planes at an angle of 70° to 110° to an axial direction of the brush; and the handle has a brush holding portion which connects with the insertion groove, and further to an interdental brush set comprising an interdental brush of which brush part is exchangeable and a brush container characterized in that: the interdental brush comprises a brush part and a handle where the brush part has an insertion groove having facing planes at an angle of 70° to 110° to an axial direction of the brush and a neck projecting to the brush direction while covering the brush axis, where a sectional shape of the neck has a major axis "R" parallel to the insertion groove; the handle has a brush holding portion which connects to the insertion groove at an end of the handle; the brush container comprises a brush detaching room and a brush containing room storing multiple replacement brush parts each of which neck is supported by a neck holding slit where a width of the neck holding slit of the brush containing room is longer than minor axis length "r" and shorter than the major axis length "R" of the neck.

In the conventional brush-exchangeable interdental brush, as the inserting direction of the brush part into a handle in the case of brush exchange is parallel to the direction of a brush axis, a problem arises such that the brush part is easy to drop out of the fixing hole during brushing. The interdental brush of the present invention has a brush part and a handle where the brush part is exchangeable characterized in that the brush part has an insertion groove 14 having facing planes 15 at an angle of 70° to 110° to a brush axial direction. As the insertion groove 14 has the facing planes 15, the planes 15 tightly contact with the planes 25 at the side of the brush holding portion of the handle 20, jounce between the handle 20 and brush part 10 during use is prevented by this unification of the handle and brush part. By setting the angle of said tightly contacting planes 15 and 25 to the direction of brush axis at 70° to 110° , respective two planes can prevent dropout of the brush part from the handle during brushing. The angle is preferably $80^{\circ} \sim 100^{\circ}$, and more preferably $85^{\circ} \sim 95^{\circ}$.

In order to prevent said dropout more securely during use, a protrusions and corresponding depressions may be formed at the planes 15 in the insertion groove 14 and planes 25 of the holding portion 22. Thereby connecting power between the handle and the brush part is enhanced. The depressions may be made either planes 15 or 25, and the protrusions corresponding to the depressions are made on the other planes. It is preferred not to form a void between the depressions and the protrusions. However as both planes contact tightly when the insertion groove and the brush holding portion are connected with each other, it is permissible to form a void at the bottom of the depressions by making the depressions deeper than the height of the protrusions. On the contrary, it is not preferred to make the protrusions higher than the depth of the depressions because both planes may not tightly contact with each other. Although the shapes of the depressions and protrusions are not in particular restricted, a linear or spherical shape may be adopted considering easiness of molding and connecting power between the brush holding portion and the insertion groove. Said depressions and protrusions may be formed on either two sets of planes or one of them, and also multiple depressions or protrusions may be made on one set of planes.

The handle has a grip by which a user holds the interdental brush during brushing and a brush holding portion at an end of the handle which connects with the insertion groove. The grip may be any shape unless it causes any difficulties in use. The brush holding portion forms an interdental brush by connecting with the insertion groove of the brush part. It is necessary for the shape of the brush holding portion not to form any gap causing jounces when it is connected with the insertion groove. Any shape may be adopted as far as such requirements are satisfied. Two brush holding portion planes are formed at the sides of a pinching jaw which are unified with two facing planes of the insertion groove without any gap therebetween. When the insertion groove are connected with the brush holding portion, a unified three-dimensional shape such as a sphere, spheroid, hemisphere, cube, rectangular parallelepiped or other polyhedron is formed.

Then a brush container is combined with above-said interdental brush to form an interdental brush set of the present invention. The brush container comprises a brush containing room storing multiple replacement brush parts each of which neck is supported by each neck holding slit and optionally a brush detaching room. A sectional view of the neck has a shape such as ellipsoid, oval, rectangle and polygon having a longer axis R in the same direction as that of the insertion groove,

and a width of the neck holding slit of the brush containing room is longer than minor axis length r and shorter than the major axis length R of the neck. By adopting above-said relations between the major axis length and minor axis length of the neck and the slit width, the replacement brush parts are stored while all insertion grooves facing up. Thereby it is possible to insert the insertion groove into the brush holding portion through one touch operation as the insertion grooves of all the replacement brushes are stored in the brush container facing up.

0010

A brush detaching room may be attached to the brush container. When using a brush-detaching slit formed at the wall of the brush detaching room, it is possible to detach from the handle and dispose of a used brush part through one touch operation without contacting hands with the old contaminated brush. It is optional to attach a lid to said brush container. The shape of the lid is optional. In the case of, for example, adopting a sleeve of match box type capable of sliding, a position of the brush detaching room may be located so as to open only the brush detaching room fully when the sleeve is partly slid. Thereby the user can dispose of only a used brush part by opening only the brush detaching room and detaching the used brush part, which prevents unwished disposition of new replacement brush parts together with the used brush part. Similarly lids may be set on the brush containing room and brush detaching room independently. A lid capable of open-close operation with a hinge may be available.

Brief Description of Drawings

Figure 1 is an example of a brush part of the interdental brush of the present invention.. Figure 2 is an example of a handle of the interdental brush of the present invention. Figure 3 is an enlarged view of a brush holding portion and connecting portion, which illustrates depressions and protrusions for fitting. Figure 4An example of a brush container of the interdental brush of the present invention. Figure 5 is an example of a conventional interdental brush. Figure 6 is another example of a conventional interdental brush. Figure 7 is the other example of a conventional interdental brush.

Best Mode for carrying out the Invention

The present invention will be further described in detail while referring to drawings. Followings are the description of symbols in the drawings: 10 is a brush

part, 11 is a brush, 12 is a neck, 13 is a connecting portion, 14 is an insertion groove, 15 is a facing planes, 20 is a handle, 21 is a grip, 22 is a brush holding portion, 23 is a pinching jaw, 24 is a parallel planes, 25 are planes, 26 is a depression, 27 is a protrusion, 30 is a brush container, 31 is a brush containing room, 32 is a neck holding slit, 33 is a detaching slit, 34 is a detaching room

Fig. 1 shows a brush part 10 of an interdental brush of the present invention. Fig. 1(b) is a front view of the interdental brush of the present invention, Fig. 1(a) is a left side view, Fig. 1(c) is a right side view, Fig. (d) is an A-A line sectional view of Fig. 1(b) and Fig. 1(e) is a B-B line sectional view in Fig. 1(b). The interdental brush of the present invention is composed of the brush part 10 shown in Fig. 1 and a handle 20 shown in Fig. 2. The interdental brush set of the present invention further comprises a brush container 30 shown in Fig. 4. The brush part 10 shown in Fig. 1 has a brush 11, a connecting portion 13, a neck 12 connecting said brush 11 with said connecting portion 13, insertion groove 14 for connecting with the handle, and facing planes 15 opposing with each other in the insertion groove. Either depressions or protrusions may be formed on the two planes 15.

The brush 11 must be easily inserted into spaces between teeth because it is intended for cleaning surfaces between teeth. The brush is composed of filaments and wire and formed by the wire being two-folded, filaments being aligned between the two-folded wire and then the wire being twisted. The brush filament material may be nylon, polyethylene, polyester and the like. Steel, stainless steel and the like may be used for the wire material. Although the sectional shape of the neck 12 shown in Fig. 1(d) is optional, when using the brush container of the present invention, elliptic, oval or polygon, for example, having major axis length R in the same direction as that of the insertion groove. The connecting portion 13 in Fig. 1 has such a shape that the insertion groove is cut out of a sphere, and the shape of the insertion groove corresponds to the shape of the brush holding portion 22 of the handle as described below, and a spherical shape is formed when the insertion groove is connected with the handle 20. The spherical shape with no useless projections or steps makes the interdental brush easy to use without irritation in oral cavity.

The brush 11 is fixed to the connecting portion 13, and in Fig. 1(b), the insertion groove 14 is formed so as to insert into the handle from the direction vertical to the axial direction of the brush 11. The handle 20 of the interdental brush of the present invention is shown in Fig. 2. Fig. 2(a) is a left side view and

Fig. 2(b) is a front view. The handle 20 is composed of a grip 21 and brush holding portion 22 located at an end of the grip. The shape of the brush holding portion corresponds to the shape of the insertion groove 14. A U-figure shaped cut is formed so as to insert the insertion groove 14 of the brush part 10 at an end thereof. Fig. 3 illustrates an enlarged view of the brush holding portion and the connecting portion inserting therein. Fig. 3(a) is a front view, Fig. 3(b) is a plan view and Fig. 3(c) is an enlarged view of the connecting portion. In case protrusions are formed on the facing planes 15 in the insertion groove, the depressions may be formed on two planes 25 of the brush holding portion 22 to enhance holding power by fitting protrusions and depressions for preventing drop-off of the brush part in oral cavity. Reversely depressions may be formed on the facing planes 15 and protrusions on the two planes 25. In the embodiment of Fig. 3, depressions 26 are formed on the planes 25 and protrusions 27 on the planes 15.

The brush holding portion 22 and the grip 21 may be produced unitedly or separately to be connected afterward. They may be molded using synthetic resin such as polyethylene, polypropylene, polyesters such as polyethylene terephthalate and polybutylene terephthalate, nylon, ABS, polystyrene and polycarbonate, however not restricted thereto.

The insertion groove 14 strictly fits in the pinching jaw 23 of the brush holding portion 22 of the handle. The sectional shape of the pinching jaw 23 in the holding portion 22 in which the insertion groove is held should be a shape unnecessary void is formed when the insertion groove is inserted and also brush part does not easily detach, and is composed of, for example, an arc having a central angle W in a range of $180^\circ < W \leq 200^\circ$ as shown in Fig. 3(a) and facing parallel planes 24. The angle W is considerably enlarged in Fig. 3(a) for explanation. When the central angle is less than 180° , holding power in the longitudinal direction of the brush part decreases, which may cause inconveniences such as drop-off of the brush during use. When exceeding 200° , it is difficult to insert the brush part into the pinching jaw and cracks may be formed at the brush holding portion. Preferred range of angle W is $182^\circ \leq W \leq 195^\circ$. When 182° or more, dropout of the brush part in use is almost prevented. When less than 195° , no excessive strong power is necessary during insertion of the brush part. $184^\circ \sim 190^\circ$ is preferred considering operationability and easiness of detachment of the brush part. To enhance the fitting between the handle and the brush holding portion and to prevent unnecessary dropout of the brush part in the oral cavity, above-said depressions and corresponding protrusions

may be formed on both planes.

Fig. 4 illustrates an example of the brush container of the present invention. Fig. 4(a) is a plan view, Fig. 4(b) a side view, Fig. 4(c) a front view, and Fig. 4(d) shows a condition where a neck of the brush part is inserted into the neck holding slit 32 of the brush containing room. Although the brush container may be composed of only a brush containing room 31, it is preferred to include a brush detaching room 34. The neck holding slit 32 is formed at the brush containing room to store replacement brushes while holding the neck of the brush part. The width of the neck holding slit 32 is longer than the minor axis r of the neck and shorter than the major axis R . Thereby all the insertion grooves are not stored on their sides. And replacement brushes are aligned in the brush container 30 so that all the insertion grooves face up, consequently each insertion groove 14 surely faces up in the brush containing room. Thereby the brush part may be attached through one touch operation.

The brush detaching room 34 has a volume and shape in which the brush part is easily included and has a detaching slit 33 at the room wall. The width of the detaching slit 33 is set so that the handle 20 is passable but the brush part 10 is not, usually larger than the thickness D of the brush holding portion 22 of the handle shown in Fig. 2(a) and connecting portion 13 is not passable. Thereby used brush part 10 is removed from the handle 20 by pulling the handle out of the brush detaching room while used brush part is remained inside the brush detaching room and brush handle goes outside through the detaching slit 33.

Then use method of the interdental brush set of the present invention is described. When the brush part is attached to the handle and the brush container has a lid, firstly the lid of the brush containing room is opened. Attachment of the brush part to the brush holding portion is simply to push the handle in the brush part of a replacement brush facing the insertion groove up in the brush containing room so that the brush holding portion is connected with the insertion groove. The interdental brush is formed through this one touch operation. Consequently user does not contaminate a new brush by touching hands directly and can brush teeth with a clean interdental brush.

During brushing, two facing planes 15 in the insertion groove 14 of the brush part hold the handle approximately vertical to the brushing direction, therefore dropout of the brush part from the handle is prevented. In the case of detaching the brush part from the handle in order to exchange the brush part, opening a lid of the

brush detaching room 34 when it has a lid, getting the brush part 10 in the detaching room 34, inserting the handle 20 into the detaching slit 33, and pulling the handle, then leaving only the brush part inside the detaching room and one-touch detachment is done. Used brush left inside the detaching room may be discarded as said before. Consequently user can dispose of the used brush part without contamination of hands or fingers with plaque, food oat and the like sticking to the brush part by touching. And without changing gripping hand, attachment of new brush part is performed as said before. Therefore users can perform attachment, detachment and disposition of the brush part without touching brush part.

Main features of the present invention are described as follows:

1. An interdental brush having a brush part and a handle where the brush part is exchangeable characterized in that: the brush part has an insertion groove 14 having facing planes 15 at an angle of 70° to 110° to an axial direction of the brush; and the handle 20 has a brush holding portion 22 which connects with the insertion groove 14.
2. the interdental brush according to claim 1 wherein the angle of the plane to the axial direction of the brush is 80° to 100° .
3. the interdental brush according to claim 1 wherein the angle of the plane to the axial direction of the brush is 85° to 95° .
4. the interdental brush according to any one of claims 1 to 3 wherein the brush part and the handle forms a unified shape when they are connected with each other.
5. the interdental brush according to claim 4 wherein the unified shape is a sphere.
6. the interdental brush according to claim 4 wherein the unified shape is an elliptic.
7. the interdental brush according to claim 4 wherein the unified shape is a polygon.
8. the interdental brush according to any one of claims 1 to 7 wherein the brush holding portion of the handle is inserted in the insertion groove of the brush part at an angle of 0° to 20° to the longitudinal direction of the handle.
9. the interdental brush according to any one of claims 1 to 7 wherein the brush holding portion of the handle fits in the insertion groove of the brush part at an angle of 20° to 90° to the longitudinal direction of the handle.
10. the interdental brush according to any one of claims 1 to 9 wherein depressions and protrusions corresponding to each other are formed at the planes of the insertion groove and the brush holding portion.

. An interdental brush set comprising an interdental brush of which brush part is exchangeable and a brush container characterized in that: the interdental brush comprises a brush part and a handle where the brush part has an insertion groove having facing planes at an angle of 70° to 110° to an axial direction of the

brush, and a neck projecting to the brush direction while covering the brush axis and a sectional shape of the neck has a major axis R in the same direction as that of the insertion groove; the handle has a brush holding portion which connects to the insertion groove at an end of the handle; the brush container stores multiple replacement brush parts each of which neck is supported by neck holding slit where the width of the neck holding slits of the brush containing room is longer than minor axis length r and shorter than the major axis length R of the neck. 21. the interdental brush set wherein the interdental brush is the interdental brush according to any one of above 1 to 9. 22. the interdental brush set according to above 20 or 21 wherein the brush container further includes a brush detaching room.

Industrial Applicability

In the interdental brush and interdental brush set of the present invention, the brush part is exchangeable, and by adopting specific attachment method of brush part to the handle, a compact interdental brush with no foreign body feeling in the oral cavity is provided. Further user can easily perform attachment, detachment and disposition of a brush part through one touch operation without touching brush part with hands or fingers and dropout of the brush part during brushing is prevented.